

ABSTRACT

An integrated circuit includes a layered superlattice material including one or more of the elements cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium.

- 5 These elements may either be A-site elements or superlattice generator elements in the layered superlattice material. In one embodiment, one or more of these elements substitute for bismuth in a bismuth layered material. They also are preferably used in combination with one or more of the following elements: strontium, calcium, barium, bismuth, cadmium, lead, titanium, tantalum, hafnium, tungsten, niobium, zirconium,
- 10 bismuth, scandium, yttrium, lanthanum, antimony, chromium, thallium, oxygen, chlorine, and fluorine. Some of these materials are ferroelectrics that crystallize at relatively low temperatures and are applied in ferroelectric non-volatile memories. Others are high dielectric constant materials that do not degrade or break down over long periods of use and are applied as the gate insulator in transistors or the charge
- 15 storage device in volatile memories.